

WHAT IS CLAIMED IS:

1. An axle driving apparatus comprising:
 - a housing;
 - an axle disposed in said housing;
 - an oil sump formed in said housing;
 - a substantially L-like shaped center section having a horizontal portion and a vertical portion disposed in said housing;
 - a hydraulic pump disposed on said horizontal portion of said center section;
 - a hydraulic motor disposed on said vertical portion of said center section for driving said axle;
 - a pair of oil passages provided in said center section;
 - a first pair of arcuate ports formed on said vertical portion of said center section and communicating with said pair of oil passages; and
 - a second pair of arcuate ports formed on said horizontal portion of said center section and being disposed substantially perpendicular to the direction in which said oil passages extend;
 - wherein one end of one of said second pair of arcuate ports is made deep to communicate with one of said pair of oil passages and one end of the other of said second pair of arcuate ports is made deep to communicate with the other of said pair of oil passages.
2. An axle driving apparatus as set forth in claim 1, wherein an end portion of each of said second pair of arcuate ports is overlapped with each of said pair of oil passages.
3. An axle driving apparatus as set forth in claim 1, wherein said hydraulic pump is a variable displacement axial piston type, in which a cylinder

block housing therein a plurality of pistons which are movable in reciprocation is rotatably disposed on said horizontal portion of said center section and heads of said pistons abut against a movable swash plate, whereby said movable swash plate is slanted to change the amount and direction of oil discharged from said hydraulic pump and a control shaft for slantingly operating said movable swash plate is disposed substantially in parallel to said axle.

4. An axle driving apparatus as set forth in claim 3, wherein said control shaft is rotatably supported by a side wall of said housing and the axis of said control shaft is coincident with an axis of slanting rotation of said movable swash plate.

5. An axle driving apparatus as set forth in claim 4, wherein an upper surface of said movable swash plate is convex and a side surface of said movable swash plate has a groove, said housing is provided with a concave inner surface for receiving the upper convex surface of said movable swash plate, and said control shaft is provided with an engaging portion engageable with said groove on said movable swash plate.

6. An axle driving apparatus comprising;
a housing;
an oil sump formed in said housing;
axles disposed in said housing;
a center section disposed in said housing;
a hydraulic pump mounted on said center section;
a hydraulic motor mounted on said center section;
a pair of oil passages for fluidly connecting said hydraulic pump and said hydraulic motor provided in said center section;
oil holes branched from said pair of oil passages formed in said center section;

a valve casings inserted into each of said oil holes;
a valve body inserted into each of said valve casings;
openings provided in said valve casings which are closed by said valve bodies and are freely opened and closed so as to constitute a check valve; and
projections formed on an inner surface of said housing which abut against end surfaces of said valve casings.

7. An axle driving apparatus as set forth in claim 6, wherein said openings of said valve casings are provided at the lower surface of each of said valve casings.

8. An axle driving apparatus as set forth in claim 6, wherein on the utmost end of each of said projections is provided an oil passage communicating with the outer peripheral surface of each of said projections, whereby said openings in said valve casings fluidly communicate with said oil sump.

9. An axle driving apparatus comprising:
a housing;
a center section disposed in said housing which is substantially L-like-shaped and has a horizontal portion and a vertical portion;
a variable displacement hydraulic pump of the axial piston type including a cylinder block in which a plurality of reciprocating pistons are housed which is rotatably mounted on said horizontal portion of said center section;
a movable swash plate disposed in said housing against which said pistons abut, wherein said movable swash plate is slantingly rotated to change the amount and direction of oil discharged from said hydraulic pump, wherein an upper surface of said movable swash plate is convex and slidable along an inner concave surface of said housing;
a groove formed in a side surface of said movable swash plate;

a swinging arm having an engaging portion which engages with said groove;

a control shaft fixed to said swinging arm;

a speed changing member interlocked with said control shaft, wherein an axis of said control shaft is coincident with a center of curvature of the convex portion of said movable swash plate.

10. An axle driving apparatus as set forth in claim 9, wherein said control shaft is disposed substantially in parallel to axles disposed in said housing.

11. A hydrostatic transmission comprising:

a housing;

an oil sump formed in said housing;

a center section having a horizontal surface and a vertical surface disposed in said housing;

a hydraulic pump having a cylinder block which is rotatably, slidably disposed on said horizontal surface of said center section;

a hydraulic motor having a cylinder block which is rotatably, slidably disposed on said vertical surface of said center section;

a pair of oil passages provided in said center section;

a first pair of arcuate ports opened on said vertical surface of said center section and communicating with said pair of oil passages;

a second pair of arcuate ports opened on said horizontal surface of said center section, wherein each of said second pair of arcuate ports has a length and a depth substantially perpendicular to each other, wherein the depth of one of said

second pair of arcuate ports is shallow at a first end and gradually deepens to a second end which fluidly communicates with one of said pair of oil passages and the depth of the other of said second pair of arcuate ports is shallow at a first end and gradually deepens to a second end which fluidly communicates with the other of said pair of oil passages, whereby feed oil discharged from said cylinder block of said hydraulic pump is introduced into said one of said pair of oil passages and feed discharge oil in said other of said pair of oil passages from said cylinder block of said hydraulic motor is introduced into said cylinder block of said hydraulic pump;

oil holes branched from said pair of oil passages formed in said center section, opened on an opposite surface of said center section which is opposite to said horizontal surface of said center section;

a valve casing inserted into each of said oil holes, wherein an outer portion of each of said valve casings projects from said opposite surface of said center section to said oil sump;

a valve body inserted into each of said valve casings;

openings provided in said respective projecting outer portions of said valve casings, wherein said openings are closed by said valve bodies and are freely opened and closed so as to constitute a check valve with said oil sump; and an oil filter disposed in said oil sump so as to cover said projecting outer portions of said valve casings on said opposite surface of said center section so that said oil filter divides said oil sump into an inner oil sump and an outer oil sump, wherein said openings of said valve casing directly communicates with said inner

oil sump.

12. The hydrostatic transmission as set forth in claim 11, wherein said respective second ends of each of said pair of arcuate ports communicates with said respective oil passages where each of said second pair of arcuate ports is overlapped with each of said pair of oil passages.

13. The hydrostatic transmission as set forth in claim 11, further comprising:

an axle disposed within said housing;
a drive train for transmitting power from said hydraulic motor to said axle disposed within said housing;
a plurality of pistons reciprocally disposed in said cylinder block of said hydraulic pump;
a movable swash plate abutting against the heads of said pistons;
and
a control shaft for slantingly operating said movable swash plate disposed substantially in parallel to said axle.